

Summary of the Office Action and status of the claims

Claims 1-24 stand rejected, of which claims 1, 9, 15, 18, 21 and 22 are independent. Independent claims 9, 15, 18, 21 and 22 have been amended to clarify that which is being claimed and/or to correct syntactical aspects of the original claims. Claims 25-34 are new.

The Office Action specifically rejects claims 1-5, 7-17, 19-21 and 23-24 under 35 U.S.C. §103(a) as being unpatentable over Pandorf et al. (U.S. Patent 5,932,332). The Office Action also rejects claim 6 under 35 U.S.C. §103(a) as being unpatentable over Pandorf in view of Johnston (U.S. Patent 4,176,557). In addition, the Office Action rejects claims 18 and 22 under 35 U.S.C. §103(a) as being unpatentable over Pandorf in view of Rickner (U.S. Patent 2,753,515).

The present application teaches and claims providing a heater that includes first and second resistive heater elements (e.g., elements 350 and 360 of Fig. 3A) and using the heater to control the temperature of a pressure transducer in general, and a transducer shell assembly in particular. These may be heated to a variety of selected operating temperatures by reconfiguring some electrical jumpers or switches. For example, the configuration shown in Fig. 5A will heat a transducer to a first operating temperature, and the configuration shown in Fig. 5B will heat the transducer to a second operating temperature. In other words, a plurality of operating temperatures may be obtained by energizing a first and/or second heating element within a heater attached to the shell.

Prior art systems, generally, are directed to pressure transducers to which a single-element heater is coupled, and provide only a single operating temperature. In some systems, such as will be discussed below, a second single-element heater is found at some location within the overall transducer system, and the heaters are not connected. The second heaters of prior art systems are generally directed to heating

other portions of the system than the transducer shell, such as an intake tube, or they apply heat directly to the pressure sensor itself.

35 U.S.C. §103(a) Rejections in View of Pandorf

Independent claims 1, 9, 15 and 21 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Pandorf, et al. Paragraph 1 of the Office Action states that Pandorf et al. teach the “pressure sensor disposed in the shell (220 and Abstract), heater (218) attached to the shell (Column 6, Lines 62-65) including first and second heating elements (232A, 232B).” Applicant respectfully traverses this rejection and disagrees with the Examiner’s characterization of the Pandorf reference, as will be discussed below.

The Pandorf reference discloses a pressure transducer assembly containing a shell to which a single heater (218 as shown in Fig. 2A) is attached. Some embodiments disclosed in Pandorf provide an auxiliary heater (e.g., 260 as shown in Fig. 5) disposed directly onto the pressure sensor (210 as shown in Fig. 2A). In other embodiments, Pandorf discloses a tube heater (232) attached to a fluid intake assembly.

The Office Action has mischaracterized the Pandorf reference; Pandorf does not disclose or suggest the claimed heater, including first and second heating elements, attached to a shell. In support of these statements, Applicants present the following remarks:

The Office Action has mischaracterized the Pandorf reference in several respects, such as by characterizing Pandorf’s electrical leads (232A, 232B) as being heater elements. In fact, electrical leads (232A, 232B) are described in Pandorf at Column 9, Lines 61 through 63, as “applying current to tube heater 232 via electrical leads 232A, 232B.” See, also, Pandorf Fig. 2D, which shows leads 232A and 232B to be providing electrical power to the tube heater 232. Thus, the Office Action has not shown first and second heating elements to be disclosed or suggested in the Pandorf reference.

Furthermore, also at ¶1 of the Office Action, the Office Action states that Pandorf et al. disclose “first and second heating elements connected in series (262, 264, and Column 19, Lines 15-66).” Again, the Office Action mischaracterizes the reference by referring to elements 262 and 264 of Pandorf as first and second heating elements. This is incorrect, as these elements (shown in Fig. 5) are thermistors, or temperature sensors, which provide a corresponding signal to controller 220B. Thermistors 262 and 264 are described in Pandorf at Column 19, Lines 16-19 which states “thermistors 262 and 264 are each separately coupled to controller 220B and . . . independently measures the temperature of each thermistor and then computes an average temperature.” Thus, the Office Action does not point to a disclosure or suggestion in Pandorf to use first and second heating elements in a heater attached to the shell.

The Office Action mischaracterizes the reference yet again at ¶1, stating that Pandorf et al. disclose “first and second heaters comprising and coupled to first and second heating elements (220D, 262).” In fact, 220D is a controller described in Pandorf at Column 20, which states “controller 220D deactivates auxiliary heater 260.” Also, as described above, element 262 of Pandorf is a thermistor, and not a heating element, as described in Pandorf at Column 19, Lines 16-19.

Thus, Pandorf does not disclose or suggest the claimed “heater attached to the shell, the heater including a first heating element and a second heating element,” recited in Applicants’ claim 1.

In addition, no motivation exists for modifying Pandorf. The Office Action offers no motivation for modifying the Pandorf reference according to Applicants’ claims. That is, no motivation exists in the record for modifying the single-element heaters of Pandorf to obtain the claimed heater having two heating elements attached to the transducer shell, as recited in Applicants’ claim 1. The Office Action merely asserts, at ¶1, that “it should be obvious that the circuit arrangement can be changed in various ways.” This is insufficient motivation for performing a specific modification to Pandorf according to Applicants’ claims. Since Pandorf et al. lack the recited heater, including

first and second heating elements, attached to a shell, and no motivation is given for modifying Pandorf as such, no *prima facie* case of obviousness has been established in the Office Action to support this rejection, and the rejection is improper.

Accordingly, the 35 U.S.C. §103(a) rejection of claim 1 in view of Pandorf should be withdrawn, and the claim should be allowed. Similarly, claims 2-5, which depend from independent claim 1, should be allowed for at least the same reasons as discussed above with regard to independent claim 1.

Regarding claim 9, the claim has been amended to clarify that the first heater is coupled to the shell and having a first electrical resistance, then applying a second electrical signal to a second heater coupled to the shell and having a second electrical resistance. Pandorf et al. do not disclose or suggest the recited acts of "*applying a first electrical signal to a first heater coupled to the shell and having a first electrical resistance, then applying a second electrical signal to a second heater coupled to the shell and having a second electrical resistance*" (see, e.g., remarks with regard to claim 1, *supra*). Furthermore, no motivation has been shown for modifying Pandorf according to Applicants' amended claim 9. Thus, the rejection is moot and should be withdrawn, and the claim should be allowed. Similarly, claims 10-12 and 14, which depend from independent claim 9, should be allowed for at least the same reasons as those given with regard to claim 9:

Regarding claim 15, the claim has been amended to clarify that the heater is coupled to the shell. The rejection is now moot, as Pandorf does not disclose or suggest the recited acts of "*coupling a heater to the shell, the heater including a first heating element and a second heating element, the first heating element being characterized by a first electrical resistance, the second heating element being characterized by a second electrical resistance, the first electrical resistance being different than the second resistance; applying a first electrical signal to the first heating element during a first period of time; and applying a second electrical signal to the second heating element during a second period of time*" (see, e.g., remarks with regard to claim 1, *supra*).

Furthermore, no motivation has been shown for modifying Pandorf according to Applicants' claim 15. Thus, the rejection is moot, improper, and should be withdrawn, and the claim should be allowed. Similarly, claims 16-17, which depend from independent claim 15, should be allowed for at least the same reasons as those given with regard to claim 15.

Regarding claims 18-20, Applicant is uncertain as to how dependent claims 19-20 have been rejected under 35 U.S.C. §103(a), while independent claim 18, from which claims 19-20 depend, was not similarly rejected. Hence, Applicants assume that the Examiner intended to reject claims 18-20 under 35 U.S.C. §103(a) in view of Pandorf, and present the following remarks.

Pandorf lacks the recited transducer of claim 18, including *"a heater attached to the shell, the heater including a first heating element and a second heating element, the first heating element being characterized by a first electrical resistance, the second heating element being characterized by a second electrical resistance," and "a switching element for selectively connecting any of: (1) the first and second heating elements in series with the electronic components; (2) the first heating element in series with the electronic components; (3) the second heating elements in series with the electronic components and (4) the first and second heating elements in parallel with the electronic components."*

Since Pandorf et al. do not disclose or suggest at least the claimed first and second heating elements and switching element, above, and no motivation has been shown for modifying the reference according to Applicants' claim 18, the rejection is improper and should be withdrawn, and the claim should be allowed. Claims 19-20 depend from independent claim 18 and should be allowed for at least the same reasons as those given in regard to claim 18.

Regarding claim 21, Pandorf lacks the recited *"heated shell disposed around the sensor, the heated shell including a first heating element and a second heating element, the first heating element being characterized by a first electrical resistance, the second heating element*

being characterized by a second electrical resistance, the first electrical resistance being different than the second electrical resistance."

First, Pandorf et al. do not disclose or suggest at least the claimed heated shell, including first and second heating elements having different electrical resistances, above. Second, the Office Action acknowledges, at ¶1, that Pandorf "does not explicitly disclose the different resistances." Third, no motivation has been shown for modifying the reference according to Applicants' claim 21. The Office Action's assertion that "it would have been obvious...to include in Pandorf the different resistances if desired enhancing the operation of a pressure sensor [sic]" is insufficient grounds to motivate the specific modification of Pandorf according to Applicants' claim 21. Thus, no *prima facie* case of obviousness for rejecting claim 21 has been established. Accordingly, the rejection is improper and should be withdrawn, and the claim should be allowed.

Regarding claims 22-24, Applicant is uncertain as to how dependent claims 23-24 have been rejected under 35 U.S.C. §103(a), while independent claim 22, from which claims 23-24 depend, was not similarly rejected. Hence, Applicants assume that the Examiner intended to reject claims 22-24 under 35 U.S.C. §103(a) in view of Pandorf, and present the following remarks.

Pandorf lacks the recited transducer of claim 22, including *"a heated shell disposed around the sensor, the heated shell including a first heating element and a second heating element, the first heating element being characterized by a first electrical resistance, the second heating element being characterized by a second electrical resistance...a switching element for selectively connecting any of: (1) the first and second heating elements in series with the electronic components; (2) the first heating element in series with the electronic components; (3) the second heating elements in series with the electronic components and (4) the first and second heating elements in parallel with the electronic components."*

Since Pandorf et al. do not disclose or suggest at least the claimed first and second heating elements and electronic components, above, and no motivation has been shown for modifying the reference according to Applicants' claim 22, the rejection is

improper and should be withdrawn, and the claim should be allowed. Claims 23-24 depend from independent claim 22, and should be allowed for at least the same reasons as those given in regard to claim 22.

35 U.S.C. §103(a) Rejections in View of Pandorf and Johnston

The Office Action rejected dependent claim 6 as unpatentable over Pandorf in view of Johnston (U.S. Patent 4,176,557). The Office Action states, at ¶2, that Pandorf teaches the claimed invention but lacks the first and second heating elements being connected in parallel, that aspect being provided by Johnston. Applicants respectfully traverse this rejection and request that it be withdrawn.

First, as discussed above with respect to Pandorf generally, Pandorf lacks the heater recited in Applicants' claim 1, vis, a "heater attached to the shell, the heater including a first heating element and a second heating element, the first heating element being characterized by a first electrical resistance, the second heating element being characterized by a second electrical resistance, the first electrical resistance being different than the second electrical resistance." Thus, the Examiner's base premise, that Pandorf teaches the claimed invention, minus the heating elements being in parallel, is erroneous.

Second, even if the Pandorf reference did teach the recited heater including the first and second heating elements, which it doesn't, the combination of Pandorf and Johnston would not yield the claimed heater attached to the shell, including two heating elements.

Johnston discloses two separate heaters (42, 108) electrically-connected in parallel in an overall pressure sensing system 10 (see Figs. 1 and 9 of Johnston). In Johnston, the heaters are not heating elements attached to a transducer shell, but rather an upper heater 42 that is disposed within an annular groove 44, and a lower heater 108 that is disposed within a groove in capsule cavity closure 70. As a note, Johnston's Fig. 9 (the heater control circuit) appears to be mislabeled, showing the upper heater 42 as "44."

Finally, no motivation is provided for combining the Pandorf and the Johnston reference.

Therefore, since claim 6 depends from allowable independent claim 1, as discussed previously, claim 6 is allowable for at least the same reasons given previously in regard to independent claim 1. Also, as neither Pandorf nor Johnston disclose or suggest the invention claimed in Applicants' claim 1, and since a combination of Pandorf and Johnston, even if proper, would not yield the claimed invention, and since no motivation exists in the record for combining Pandorf and Johnston, the rejection is improper. Applicants respectfully request that the rejection of claim 6 be withdrawn and the claim be allowed.

35 U.S.C. §103(a) Rejections in View of Pandorf and Rickner

The Office Action rejected dependent claims 18 and 22 as unpatentable over Pandorf in view of Rickner (U.S. Patent 2,753,515). The Office Action states, at ¶13, that Pandorf teaches the claimed invention but lacks the claimed switching element, that aspect being provided by Rickner. Applicants respectfully traverse this rejection and request that it be withdrawn.

Regarding claim 18, as discussed above with respect to Pandorf generally, Pandorf lacks the claimed pressure transducer, including *"a heater attached to the shell, the heater including a first heating element and a second heating element, the first heating element being characterized by a first electrical resistance, the second heating element being characterized by a second electrical resistance."* Thus, the Examiner's base premise, that Pandorf teaches the claimed invention, minus the switching element, is erroneous.

Additionally, even if the Pandorf reference did teach the recited heater including the first and second heating elements, which it doesn't, the combination of Pandorf and Rickner would not yield the claimed heater attached to the shell, including two heating elements and switching electronics therefor. Specifically, Rickner's switch is merely a

differential pressure switch, and is not the claimed *"switching element for selectively connecting any of: (1) the first and second heating elements in series with the electronic components; (2) the first heating element in series with the electronic components; (3) the second heating elements in series with the electronic components and (4) the first and second heating elements in parallel with the electronic components."*

Therefore, since Pandorf and Rickner, taken individually or in combination, do not disclose or suggest Applicants' invention recited in claim 18, and since no motivation exists in the record for combining Pandorf and Rickner, the rejection of claim 18 is improper and should be withdrawn, and the claim should be allowed.

Regarding claim 22, as discussed above with respect to claims 1 and 18, Pandorf lacks the claimed pressure transducer, and the Examiner's base premise, that Pandorf teaches the claimed invention, minus the switching element, is erroneous.

Additionally, even if the Pandorf reference did teach the recited heater including the first and second heating elements, which it doesn't, the combination of Pandorf and Rickner would not yield the claimed heated shell, including two heating elements and switching electronics therefor. Specifically, Rickner's switch is merely a differential pressure switch, and is not the claimed *"switching element for selectively connecting any of: (1) the first and second heating elements in series with the electronic components; (2) the first heating element in series with the electronic components; (3) the second heating elements in series with the electronic components and (4) the first and second heating elements in parallel with the electronic components."*

Therefore, since Pandorf and Rickner, taken individually or in combination, do not disclose or suggest Applicants' invention recited in claim 22, and since no motivation exists in the record for combining Pandorf and Rickner, the rejection of claim 22 is improper and should be withdrawn, and the claim should be allowed.

Newly-presented claims 25-32 depend, either directly or indirectly, from allowable independent claims 1, 9, 15, 18, 21 and 22. Therefore, claims 25-34 should be

allowed for at least the same reasons as discussed in regard to their respective independent claims.

CONCLUSION

The present application and all claims therein are believed to be in condition for allowance. An early and favorable response to this paper is hereby earnestly solicited. If any issues remain outstanding, the Examiner is urged to contact the Applicants' representatives at the telephone number listed below. Also, if any fees or credits accrue, including for extensions of time, please charge or credit such fees to Deposit Account 08-0219.

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Marked-up version of the amended claims

9. A method of heating at least a [portion]shell of a pressure transducer, the method comprising applying [an]a first electrical signal to a first heater coupled to the shell and having[that provides] a first electrical resistance[and], then applying [an]a second electrical signal to a second heater coupled to the shell and having[that provides] a second electrical resistance.

15. A method of heating at least a [portion]shell of a pressure transducer, the method comprising:

(A) [providing]coupling a heater to the shell, the heater including a first heating element and a second heating element, the first heating element being characterized by a first electrical resistance, the second heating element being characterized by a second electrical resistance, the first electrical resistance being different than the second resistance;

(B) applying [an]a first electrical signal to the first heating element during a first period of time; and

(C) applying [an]a second electrical signal to the second heating element during a second period of time.

18. A pressure transducer, including:

(A) a shell;

(B) a pressure sensor disposed in the shell;

(C) a heater attached to the shell, the heater including a first heating element and a second heating element, the first heating element being characterized by a first electrical resistance, the second heating element being characterized by a second electrical resistance;

(D) one or more electronic components for applying an electrical signal to the heater, the heater generating heat in response to the electrical signal;

(E) a switching element for selectively connecting any of: (1) the first and second heating elements in series with the electronic components[and]; (2) the first heating element in series with the [electric]electronic components[,]; (3) the second heating elements in series with the electronic components[, or] and (4) the first and second heating elements in parallel with the electronic components.

21. A pressure transducer, including:

(A) a pressure sensor;

[(C)](B) a heated shell disposed around the sensor, the heated shell including a first heating element and a second heating element, the first heating element being characterized by a first electrical resistance, the second heating element being characterized by a second electrical resistance, the first electrical resistance being different than the second electrical resistance.

22. A pressure transducer, including:

(A) a pressure sensor;

[(C)](B) a heated shell disposed around the sensor, the heated shell including a first heating element and a second heating element, the first heating element being characterized by a first electrical resistance, the second heating element being characterized by a second electrical resistance;

[(D)](C) one or more electronic components for applying an electrical signal to the [heater]heated shell, the [heater]heated shell generating heat in response to the electrical signal; and

[(E)](D) a switching element for selectively connecting any of: (1) the first and second heating elements in series with the electronic components[and]; (2) the first heating element in series with the [electric]electronic components[,]; (3) the second

heating elements in series with the electronic components[, or] and (4) the first and second heating elements in parallel with the electronic components.